June 17th, 2021 G-5422

Cascade Apartments, LLC
c/o Mr. Simon Simon
2812 Architecture
Phone: (425) 252-2153
Email: Simon@2812Architecture.com

Subject: **Geotechnical Engineering Investigation**
Cascade Mixed-Use Building
Parcel #: 31052100307300
Arlington, Washington

Dear Cascade Apartments, LLC:

At your request, GEO Group Northwest, Inc., conducted a geotechnical engineering investigation for the proposed four-story mixed-use building at the above-subject location in the Smokey Point community of Arlington, Washington**.** The scope of our services included review of the area geologic map; assessment of subsurface soil and groundwater conditions; and preparation of this report of our findings, conclusions, and recommendations.

SITE CONDITIONS

Site Description

The project site is located in the Smokey Point community of Arlington, Washington, as illustrated in *Plate 1 – Site Location Map*. The parcel is approximately rectangular-shaped and is 80,399 square feet (1.84 acres) in size. The site is bounded by commercial developed property to the east and south, and by residential developed property to the west and north. The parcel topography is generally level and averages approximately 125 feet of elevation above sea level. Currently, the site appears to be used as a trucking and construction staging area and the ground surface is surfaced with crushed rock. The central area of the parcel is not vegetated though the site perimeter has a variety of shrubs, blackberry bramble, and some trees.

SITE INVESTIGATION

Geologic Overview

According to published geologic mapping of the area, the underlying soils of the project site are identified as Marysville Sand Member (Qvrm) deposits consisting of loose to medium dense, clean sand with trace amounts of gravel and silt.

Subsurface Investigation

On May 24th, 2021, Garrett Dean, Staff Engineering Geologist from our firm, visited the site to perform a visual reconnaissance of the site and investigate the subsurface soil conditions. In addition to our reconnaissance, we oversaw the drilling of two exploratory soil borings, B1 and B2. The boring locations are illustrated on *Plate 2 – Site Plan*.

The soils encountered in B-1 consisted of a surface layer of crushed rock base course, underlain with medium dense sand with some subrounded gravel to a depth of approximately 27.5 feet. Dense sand was encountered between approximately 27.5 and 32.5 feet of depth. Soils below the dense sand in B-1 consisted of medium stiff to stiff silt with trace sand to the bottom of the boring at a depth of 56.5 feet. Groundwater was encountered at a depth of approximately 7.5 feet below the ground surface in boring B-1.

The soil profile encountered in B-2 was comparable to what was observed in B-1. Soils encountered in B-2 consisted of a surface layer of crushed rock base course, underlain with medium dense sand with some subrounded gravel to a depth of approximately 47.5 feet. Dense sand of the same composition was encountered between approximately 47.5 and 52 feet below surface. The bottom sample of the boring, collected between approximately 55 and 56.5 feet below the surface, consisted of loose sand. Groundwater was encountered at a depth of approximately 7.5 feet below the ground surface in boring B-2. For information about the soils encountered, please refer to the boring log in *Appendix A*.

SITE SEISMICITY AND SOIL LIQUEFACTION EVALUATION

In accordance with the 2018 International Building Code, the site classification is Site Class D (stiff soil). In our opinion, historic seismic activity of the area has caused prior settlement of the deposit, mitigating the potential for liquefaction and/or lateral spreading during a strong motion earthquake. Soils that typically are susceptible to liquefaction consist of saturated, fine to medium grained sandy soils with little or no fines which have standard penetration test (SPT) N values of 15 or less. Based on our site investigation borings B-1 and B-2, the corrected standard penetration blow counts are over 15, and not likely to liquefy under the design earthquake for the region. No seismic mitigation measures are recommended, with the exception of the addition of design criteria for seismically induced soil loads on permanent below-grade basement and retaining walls.

CONCLUSIONS AND RECOMMENDATIONS

The following sections of this report present our recommendations regarding building support and soil bearing capacity, earthwork and excavation slopes, temporary excavation support, slab-on-grade floors, conventional concrete basement and retaining walls, and subsurface drainage. Specific recommendations regarding these subjects are presented in the following sections of this report.

Shallow Groundwater Considerations

Groundwater was encountered at approximately 7.5 feet below the ground surface in the soil borings completed during our investigation. Therefore, we do not recommend excavation or construction to depths at or below the water table. In our opinion, water stops and waterproofing must be utilized for the wall to footing joints. Construction below the water table is possible, but very expensive and dewatering can damage adjacent and roadways.

Foundations

Soils that are anticipated to be acceptable for building support were encountered at the surface near borings B-1 and B-2 of our investigation. Based on our findings, it is our opinion that the proposed building be supported on a rebar-reinforced structural slab founded on conventional concrete strip and column footings that bear directly on a 1-foot-thick crushed rock structural fill pad underlain with a layer of filter fabric over a subgrade of medium dense native soils. Our recommended design criteria for conventional footing foundations supported on a structural fill pad are provided below.

- Allowable bearing pressure, including all dead and live loads:
  - Undisturbed, medium dense or dense soil = 2,000 psf
  - Structural fill placed on medium dense or dense soil = 2,000 psf

- Minimum depth to base of perimeter footing below adjacent exterior grade = 18 inches

- Minimum depth to bottom of interior footings below top of floor slab = 12 inches

- Minimum width of wall footings = 16 inches

- Minimum lateral dimension of column footings = 24 inches

- Estimated post-construction settlement = ½ inch

- Estimated post-construction differential settlement across building width = ½ inch

A one-third increase in the above allowable bearing pressures can be used when considering short-term transitory wind or seismic loads.

Lateral loads against the building foundations can be resisted by friction between the foundation and the supporting subgrade or by passive earth pressure acting on the buried portions of the foundations. For the latter case, the foundations must be poured "neat" against the existing undisturbed soil or be backfilled with compacted structural fill. Our recommended parameters are as follows:

- Passive Pressure (Lateral Resistance)
  350 pcf, equivalent fluid weight, for structural fill or competent undisturbed native soil

- Coefficient of Friction (Friction Factor)
  0.35 for structural fill or competent undisturbed native soil

Conventional Retaining and Basement Walls

Conventional concrete retaining or basement walls may be supported on spread footing foundations which are supported per the recommendations provided above in this report. Walls that are restrained horizontally are considered unyielding and should be designed for lateral soil pressure under the at-rest condition. Walls that are free to rotate should be designed for an active lateral soil pressure.

- At-Rest Soil Pressure

  Walls supported horizontally (i.e., floor framing) are considered unyielding and should be designed under the at-rest condition. We recommend using a design lateral soil pressure with an equivalent fluid density of 45 pcf for level ground above the wall.

- Active Soil Pressure

  Cantilever walls designed to yield an amount equal to 0.002 times the wall height should be designed under an active soil pressure condition. We recommend using a design lateral soil pressure with an equivalent fluid density of 35 pcf for level ground above the wall.

- Seismic Earth Pressure

  In addition to the above triangular lateral soil pressures, a rectangular pressure of 8H should be added for permanent below grade walls to account for seismically induced dynamic soil loads. Where H is the overall height of the wall in feet.

- Passive Earth Pressure and Base Friction

  The available passive earth pressure that can be mobilized to resist lateral forces may be assumed to be equal to 350 pcf equivalent fluid weight for both undisturbed soils and engineered structural fill. The base friction that can be generated between concrete and undisturbed bearing soils or engineered structural fill may be based on an assumed 0.35. The soil design parameters are allowable values and include a safety factor of 2.

The active and at-rest design pressures are based on a fully drained wall condition and do not include the effects of surcharges. For sloped ground above walls, a surcharge equivalent to

50 percent of the soil height above the wall (soil unit weight 125 pcf) should be used in addition to the above soil pressure. Traffic and construction equipment surcharge may be considered as a uniform surcharge equivalent to two (2) feet of soil acting over the full depth of the active pressure. Below grade walls should be drained to prevent the buildup of hydrostatic pressure behind the wall, as discussed in the Drainage section of this report. Restrained walls designed should be backfilled after completing their lateral restraint is in place or per the approval of the structural design engineer.

Concrete Slabs-on-Grade

Slab-on-grade floors should be constructed on a firm, unyielding subgrade. During preparation of the slab subgrade, any areas of the subgrade that have been disturbed by construction activity should be either re-compacted or excavated and replaced with compacted structural fill. We recommend that structural fill placed below slab-on-grade floors conform to the earthwork and grading recommendations provided in this report.

To avoid moisture build-up on the subgrade, the floor slab should be placed on a capillary break, which is in turn placed on the prepared subgrade. The capillary break should consist of a 6”-minimum thickness layer of crushed rock or gravel that contains no more than five percent material finer than a No. 4 sieve. A vapor barrier, such as a 10-mil plastic membrane, should be placed over the capillary break and taped or sealed to minimize water vapor transmission upward through the slab, if post-construction vapor transmission is undesirable.

Drainage

Water should not be allowed to stand in areas where footings, slabs, or pavements are to be constructed. Final site grades should provide drainage away from the building structure. Drainage should be installed against below-grade walls to prevent moisture intrusion and a buildup of hydrostatic pressure. To facilitate drainage behind below grade walls, we recommend installing a vertical drain mat (sheet drain) such as Miradrain 6000, or equivalent, with a footing drain at the base of the wall, as illustrated in *Plate 3 – Typical Basement Wall Drainage*. Wall backfill against the vertical drain mat should be compacted to a minimum of 90 percent of the material’s maximum dry density to mitigate clogging of the filter fabric.

Footing drains, consisting of a 4-inch minimum diameter, rigid perforated drain pipe, should extend around new perimeter foundations and be installed behind new basement and retaining walls. Footing drains should be bedded in washed drain rock and the rock wrapped with

geotextile filter fabric, such as Mirafi 140N, or equivalent, as illustrated *Plate 4 – Typical Footing Drain*. The drain rock should extend above the base of the vertical drain mat.
Roof and other drain lines should not be connected to the footing drain system. We recommend installing a sump pump system if the footing drain system cannot drain by gravity to a discharge location. Installation of clean-outs are recommended to allow periodic maintenance of the drain system.

Grading and Earthwork

Erosion Control

Temporary erosion and sedimentation controls (TESCs), such as silt fences, should be installed down-gradient of the areas to be disturbed to prevent sediment-laden runoff from being discharged off site. Surface runoff should not be allowed to flow over the top of slopes into excavations. During wet weather, exposed soils should be covered with plastic sheeting or straw mulch. Stockpiled soils should be covered with plastic tarps. For permanent erosion control disturbed soils should be landscaped and mulched upon completion of the site work.
A construction entrance consisting of 2- to 4-inch size crushed rock should be installed to prevent tracking onto the street. The construction entrance area should be cleared and grubbed prior to rock placement and we recommend underlaying the rock with a woven geotextile such as Mirafi 500X, or equivalent, to provide separation between the rock and subgrade soil.

Excavations and Slopes

Temporary excavation slopes should not be greater than the limits specified in local, state and federal government safety regulations. We recommend that temporary cuts greater than 4 feet in height be sloped at inclinations up to 1H:1V (Horizontal: Vertical) in loose to medium dense soils. Temporary excavations in very dense, hardpan soils can be sloped near vertical under the observation of the geotechnical engineer. Permanent cut and fill slopes should be inclined no steeper than 2.5H:1V. Steeper permanent fill slopes can be achieved with the use of geogrid for lateral reinforcement. Slopes that are to be maintained or mowed should be sloped at 3H:1V, or less.

Fill slopes should consist of granular material compacted to a minimum of 90 percent of the material's maximum dry density. If supporting structural elements, the fill should be compacted to the structural fill specification of 92 percent.

Based on the subsurface findings, groundwater seepage is anticipated at a depth of 7.5 feet below the surface grade. Excavation should not continue below the encountered groundwater horizon. If water seepage or other adverse conditions are encountered, excavation should be halted, and the geotechnical engineer should be contacted to review the site conditions.

Structural Fill

Structural fill is defined as fill soil supporting building foundations, floor slabs, pavements, sidewalks or other structures. Structural fill should be free of organic and other deleterious substances and have a maximum fragment size of 3 inches. For structural fill underlying footings and the structural slab, 1-1/4-inch crushed rock with no minus fraction should be used. The surficial sandy site soils were observed to contain trace proportions of fines and in our opinion may be used as structural fill for other elements of the project. In lieu of the sandy site soils, other materials such as recycled crushed concrete may be used.

Structural fill should be placed and compacted at or near the material's optimum moisture content and in lifts that are 10 inches thick or less. Below slab-on-grade floors, foundations, and other structural elements, structural fill should be compacted to a minimum of 92 percent of the material's maximum dry density, as determined by ASTM Test Designation D-1557 (Modified Proctor). For driveways, structural fill should be compacted to 90 percent, with the exception of the top 12 inches which should be compacted to 95 percent. Fill behind retaining walls and next to building foundation walls should be compacted to a minimum of 90 percent (92 percent if supporting structural elements; if supporting pavements, the top 12 inches should be compacted to 95 percent).

Utility trench backfill within the City right-of-way should be compacted to the specifications required by the City, sewer or water district. Observation and compaction testing may be required at the time of fill placement to document and verify that the compaction specifications are achieved.

Pavements

Provided the soil subgrade is dense and unyielding, we recommend an asphalt pavement section for light traffic loads consisting of 2 inches Class B asphalt concrete (1/2-inch HMA) over 4 inches of 5/8-minus crushed rock base. The pavement section for heavier traffic loads, such as for garbage trucks, should consist of 3 inches Class B asphalt concrete over 6 inches of 5/8-inch minus crushed rock base. The pavement section design should be provided by the project civil engineer.

Pavement performance is strictly related to the condition of the underlying subgrade. If the subgrade is inadequate, settlement and movement of the subgrade, such as alligatoring, can be reflected up through to the pavement surface no matter what pavement section is constructed. If loose subgrade soils are present, we recommend improving the subgrade by placing the pavement section on a minimum of 2 feet of granular structural fill or crushed rock. The subgrade below the structural fill should be compacted prior to placement of the structural fill and be evaluated by the geotechnical engineer. An unstable condition my require the use of a woven geotextile to separate the underlying soil from the granular overlying structural fill. For on-site pavement, structural fill should be compacted to a minimum of 90 percent, except for the top 12 inches which should be compacted to 95 percent of the materials maximum dry density based on ASTM D-1557 (Modified Proctor).

Prior to paving, the subgrade should be proof-rolled with a heavy piece of equipment, such as a loaded dump truck, under the observation of the geotechnical engineer, to verify that the subgrade is dense, unyielding, and suitable to support the pavement section. Soft or unstable subgrade identified during the proof-roll should be evaluated by the geotechnical engineer and stabilized prior to paving.

LIMITATIONS

The findings and recommendations stated herein are based on field observations, our experience on similar projects and our professional judgment. The recommendations presented herein are our professional opinions derived in a manner consistent with the level of care and skill ordinarily exercised by other members of the profession currently practicing under similar conditions in this area and within the project schedule and budget constraints. No warranty is expressed or implied. In the event that site conditions are found to differ from those described in this report, we should be notified so that the relevant recommendations in this report can be reevaluated and modified if appropriate.

CLOSING

We appreciate the opportunity to provide you with geotechnical engineering services for this project. Please do not hesitate to contact us if you have any questions regarding this report.

Sincerely,

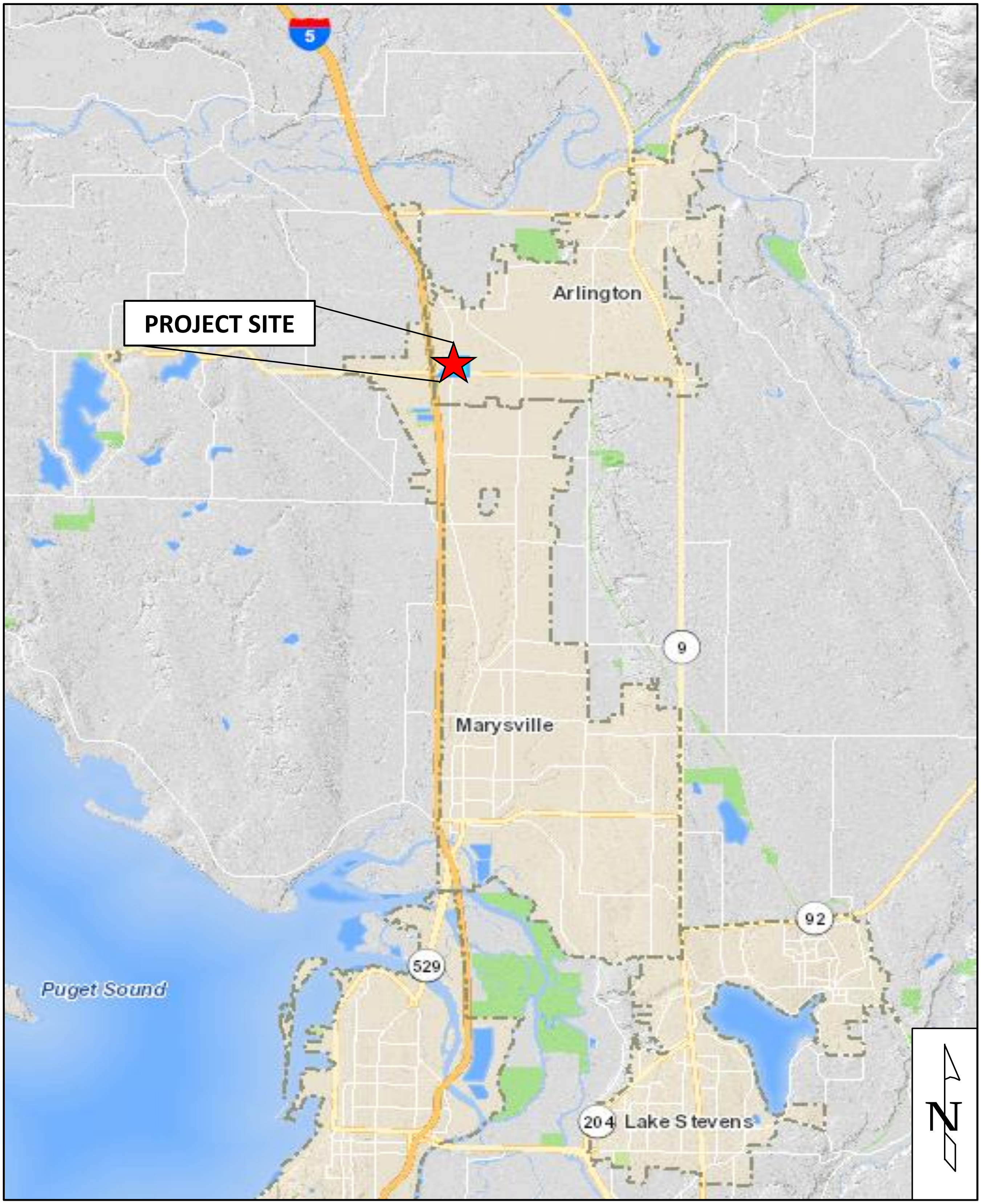
GEO Group Northwest, Inc.

Garrett Dean, G.I.T.
Staff Engineering Geologist

William Chang, P.E.
Principal Engineer

Attachments:

Plate 1 – Site Location Map
Plate 2 – Site Plan
Plate 3 – Typical Basement Wall Drain
Plate 4 – Typical Footing Drain
Appendix A – USCS Soil Classification & Soil Boring Logs



Source: Snohomish County Assessor | SCOPI, 2021

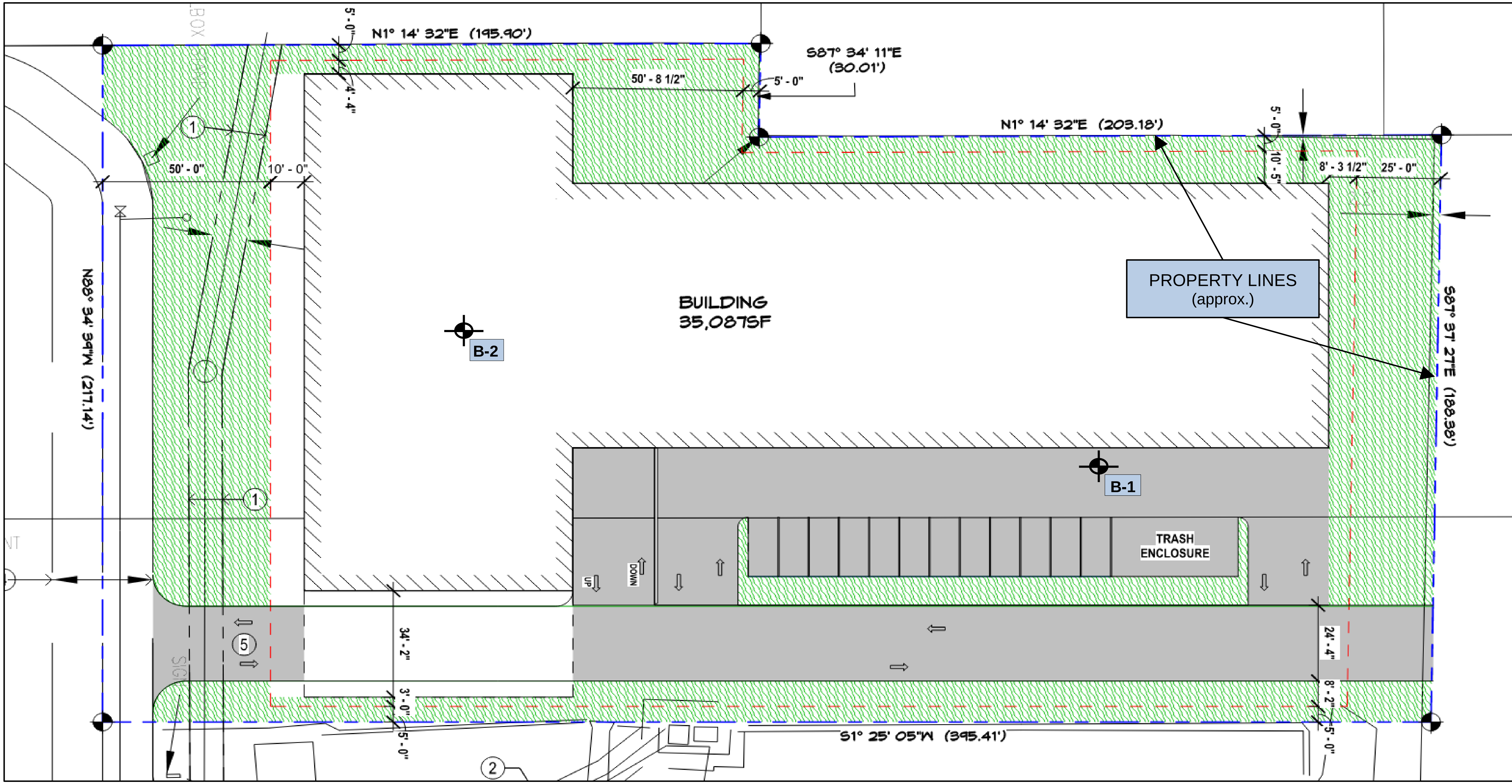
GEO Group Northwest, Inc.

Geotechnical Engineers, Geologists, & Environmental Scientists

SITE LOCATION MAP

CASCADE MIXED-USE BUILDING
PARCEL #: 31052100307300
ARLINGTON, WASHINGTON

SCALE NONE	**DATE** 6/17/2021	**MADE** GD	**CHKD** WC	**JOB NO.** G-5422	**PLATE** 1



Boring Number & Approximate Location

B-#

0 30' 60'

Approx. Scale: 1 inch = 30'

N

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

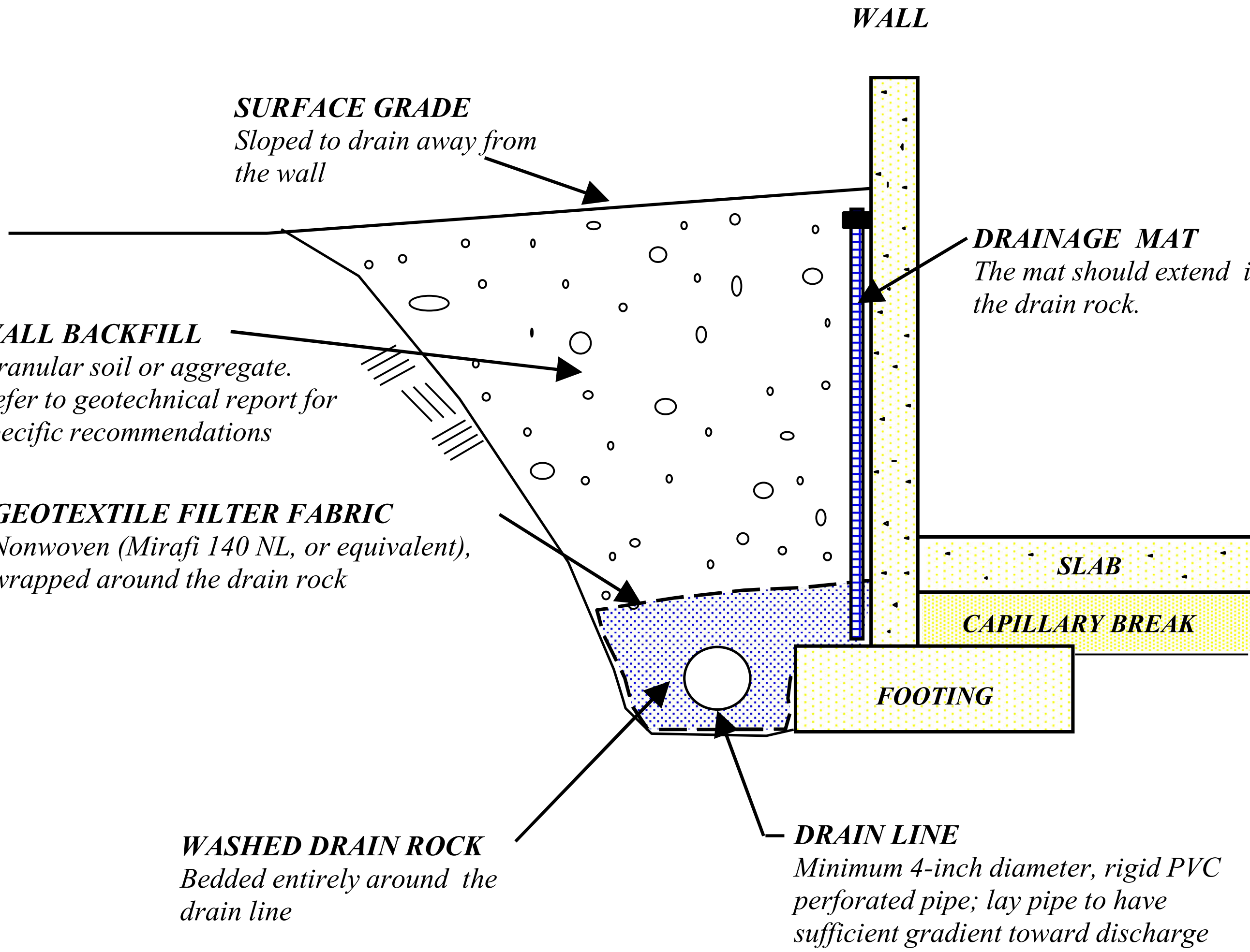
SITE PLAN

CASCADE MIXED-USE BUILDING
PARCEL #: 31052100307300
ARLINGTON, WASHINGTON

SCALE	DATE	MADE	CHKD	JOB NO.	PLATE
As Shown	6/17/21	GD	WC	G-5422	2

This Site Plan Adapted From Site Plan & Cover Sheet, Apartment Building for: ANPPR CORPORATION, Prepared 2812 Architecture, Dated March 9th, 2021

TYPICAL BASEMENT WALL DRAIN



NOT TO SCALE

NOTES:

1.) Do not replace rigid PVC pipe with flexible corrugated plastic pipe.

2.) Perforated PVC pipe should be tight jointed and laid with perforations oriented downward. The pipe should be gently sloped to provide flow toward the tightline or discharge location.

3.) Do not connect other drain lines into the footing drain system.

4.) Backfill should meet structural fill specifications if it will support driveways, sidewalks, patios, or other structures. Refer to the geotechnical engineering report for structural fill recommendations.

5.) Surface grade above the backfill can be covered with a layer of relatively impermeable topsoil or pavement or slab to reduce infiltration of surface water into the backfill and drainage system

GEO Group Northwest, Inc.
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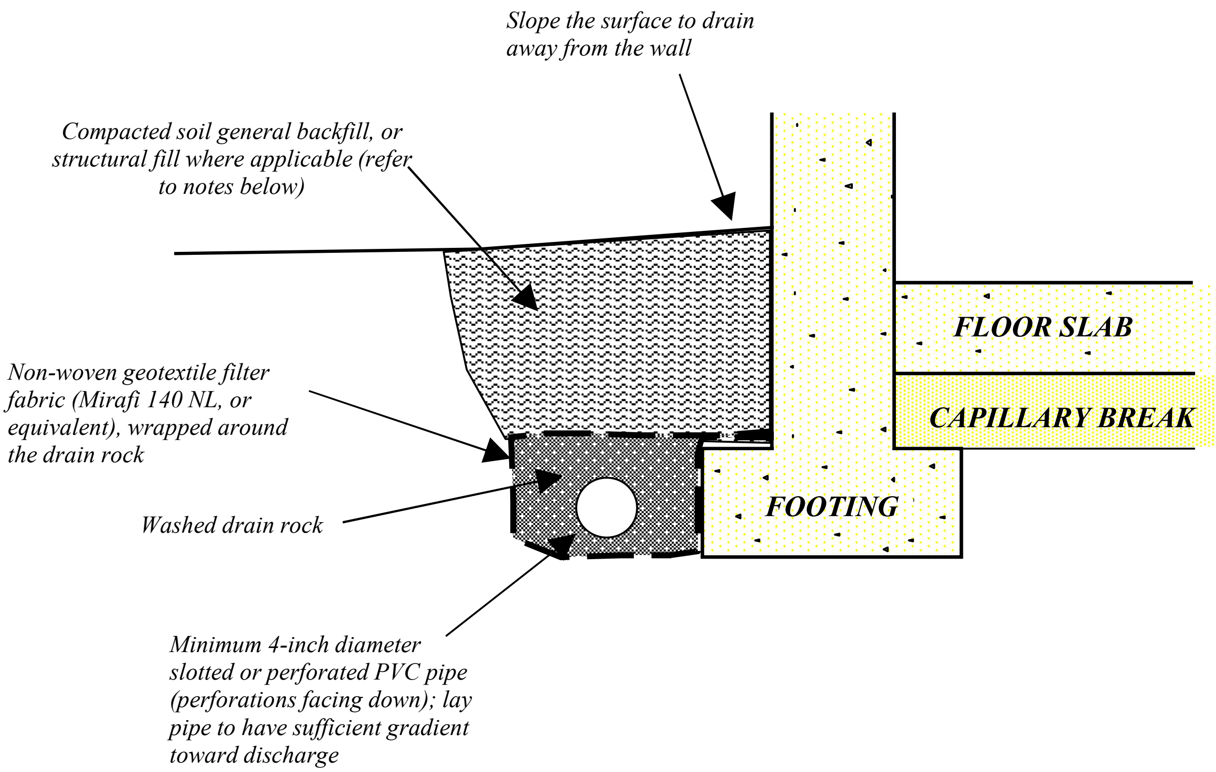
TYPICAL BASEMENT WALL DRAIN

CASCADE MIXED-USE BUILDING
PARCEL #: 32052100307300
ARLINGTON, WASHINGTON

SCALE NONE	DATE 6/17/2021	MADE GD	CHKD WC	JOB NO. G-5422	PLATE 3

TYPICAL FOOTING DRAIN



NOT TO SCALE

NOTES:

1.) Perforated or slotted rigid PVC pipe should be tight jointed and laid with perforations or slots down, and with positive gradient toward discharge location(s). The pipe should be placed at or slightly above the elevation of the bottom of the footing. Do not replace rigid PVC pipe with flexible corrugated plastic pipe.

2.) Do not connect other drainage lines to the footing drain lines. Drain line cleanouts should be installed at appropriate locations to allow inspection and maintenance of the lines after construction.

3.) If the backfill will support sidewalks, driveways, patios, or other structures, it should be compacted to at least 90% of its maximum dry density based on the Modified Proctor test method, except that the top 12 inches of the backfill should be compacted to at least 95% of the maximum dry density.

4.) The geotextile filter fabric should be placed around the drain rock as shown, and not wrapped directly around the pipe.

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

TYPICAL FOOTING DRAIN
CASCADE MIXED-USE BUILDING
PARCEL #: 31052100307300
ARLINGTON, WASHINGTON

SCALE: NONE	DATE: 6/17/2021	MADE: GD	CHKD: WC	JOB NO. G-5422	PLATE 4

APPENDIX A

G-5422

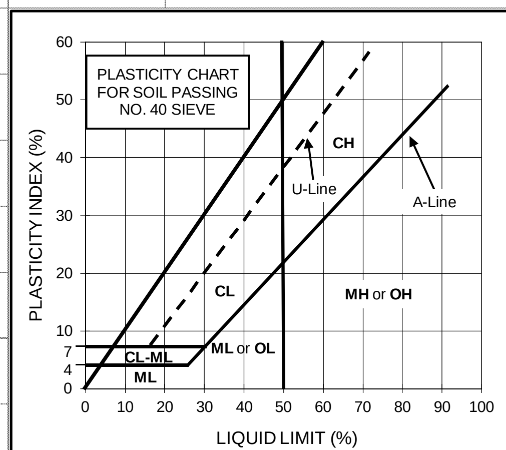
USCS SOIL CLASSIFICATION & SOIL BORING LOGS

GEO Group Northwest, Inc.

SOIL CLASSIFICATION & PENETRATION TEST DATA EXPLANATION

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA	
COARSE-GRAINED SOILS More Than Half by Weight Larger Than No. 200 Sieve	**GRAVELS** (More Than Half Coarse Fraction is Larger Than No. 4 Sieve)	**CLEAN GRAVELS** (little or no fines)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURE, LITTLE OR NO FINES	CONTENT OF FINES BELOW 5%	Cu = (D60 / D10) greater than 4 Cc = $(D30)^2$ / (D10 * D60) between 1 and 3
			GP	POORLY GRADED GRAVELS, AND GRAVEL-SAND MIXTURES LITTLE OR NO FINES		CLEAN GRAVELS NOT MEETING ABOVE REQUIREMENTS
		DIRTY GRAVELS (with some fines)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%	GM: ATTERBERG LIMITS BELOW "A" LINE. or P.I. LESS THAN 4
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES		GC: ATTERBERG LIMITS ABOVE "A" LINE. or P.I. MORE THAN 7
	SANDS (More Than Half Coarse Fraction is Smaller Than No. 4 Sieve)	**CLEAN SANDS** (little or no fines)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	CONTENT OF FINES BELOW 5%	Cu = (D60 / D10) greater than 6 Cc = $(D30)^2$ / (D10 * D60) between 1 and 3
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES		CLEAN SANDS NOT MEETING ABOVE REQUIREMENTS
		DIRTY SANDS (with some fines)	SM	SILTY SANDS, SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%	ATTERBERG LIMITS BELOW "A" LINE with P.I. LESS THAN 4
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE "A" LINE with P.I. MORE THAN 7
FINE-GRAINED SOILS Less Than Half by Weight Larger Than No. 200 Sieve	**SILTS** (Below A-Line on Plasticity Chart, Negligible Organics)	Liquid Limit < 50%	ML	INORGANIC SILTS, ROCK FLOUR, SANDY SILTS OF SLIGHT PLASTICITY		
		Liquid Limit > 50%	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOIL		
	CLAYS (Above A-Line on Plasticity Chart, Negligible Organics)	Liquid Limit < 50%	CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, CLEAN CLAYS		
		Liquid Limit > 50%	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS		
	ORGANIC SILTS & CLAYS (Below A-Line on Plasticity Chart)	Liquid Limit < 50%	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY		
		Liquid Limit > 50%	OH	ORGANIC CLAYS OF HIGH PLASTICITY		
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS		



SOIL PARTICLE SIZE

FRACTION	U.S. STANDARD SIEVE: Passing Sieve	Passing Size (mm)	Retained Sieve	Retained Size (mm)
SILT / CLAY	#200	0.075		
SAND				
FINE	#40	0.425	#200	0.075
MEDIUM	#10	2.00	#40	0.425
COARSE	#4	4.75	#10	2.00
GRAVEL				
FINE	0.75"	19	#4	4.75
COARSE	3"	76	0.75"	19
COBBLES	76 mm to 203 mm			
BOULDERS	> 203 mm			
ROCK FRAGMENTS	> 76 mm			
ROCK	>0.76 cubic meter in volume			

GENERAL GUIDANCE FOR ENGINEERING PROPERTIES OF SOILS, BASED ON STANDARD PENETRATION TEST (SPT) DATA

SANDY SOILS: Blow Counts N	Relative Density, %	Friction Angle φ, degrees	Description	SILTY & CLAYEY SOILS: Blow Counts N	Unconfined Strength q_u, tsf	Description
0 - 4	0 -15		Very Loose	< 2	< 0.25	Very soft
4 - 10	15 - 35	26 - 30	Loose	2 - 4	0.25 - 0.50	Soft
10 - 30	35 - 65	28 - 35	Medium Dense	4 - 8	0.50 - 1.00	Medium Stiff
30 - 50	65 - 85	35 - 42	Dense	8 - 15	1.00 - 2.00	Stiff
> 50	85 - 100	38 - 46	Very Dense	15 - 30	2.00 - 4.00	Very Stiff
				> 30	> 4.00	Hard

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists
13705 Bel-Red Road
Phone (425) 649-8757
Bellevue, WA 98005
E-mail: info@geogrourpnw.com

APPEND A1

BORING NO. B - 1

Logged By: GD
Drilled By: GDP, Inc.
Date Drilled: 5/24/2021
Surface Elev. Approx. 125' ±

Depth ft.	Elevation	USCS Code	Description	Sample Loc.	Sample No.	SPT Blow Counts + Corrected N	Water Content %	Other Tests/ Comments
		GW	GRAVEL, crushed-rock base coarse on surface, then:					
		SW	SAND, brown, dry, medium dense; fine to medium grained, some subrounded gravel, some oxidation staining			12,6,8 (N=14) (N'=25)	4.4	
5		SW	SAND, brown/gray, dry, medium dense; fine to coarse grained, trace subrounded gravel, some oxidation staining			4,6,8 (N=14) (N'=22)	6.0	
		SW	SAND, gray, wet, medium dense; fine to coarse grained, some subrounded gravel			8,8,9 (N=17) (N'=23)	11.8	Water in drill hole measured at 7.5' below the ground surface. Interpreted as height of groundwater table.
10		SW	SAND, as above			15,11,8 (N=19) (N'=23)	13.1	
		SW	SAND, as above			12,6,7 (N=13) (N'= 16)	15.3	
15		SW	SAND, gray, wet, medium dense; fine to coarse grained, trace subrounded gravel			2,5,7 (N=12) (N'=15)	22.4	
20		SW	SAND, gray, wet, medium dense; fine to coarse grained, some subrounded gravel			10,9,8 (N=17) (N'=16)	16.1	
25								

LEGEND: 2" O.D. SPT Sampler; 3" O.D. California Sampler; ▽ Water Level noted during drilling; ▼ Water Level measured at later time, as noted

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

BORING LOG

CASCADE MIXED-USE BUILDING
PARCEL #: 31052100307300
ARLINGTON, WASHINGTON

JOB NO. G-5422 **DATE** 6/17/2021 **APPEND** A2

BORING NO. B - 1

Logged By: GD
Drilled By: GDP, Inc.
Date Drilled: 5/24/2021
Surface Elev. Approx. 125' ±

Depth ft.	Elevation	USCS Code	Description	Sample Loc.	Sample No.	SPT Blow Counts + Corrected N	Water Content %	Other Tests/ Comments
		SW	SAND, gray, wet, medium dense; fine to coarse grained, trace subrounded gravel			9,11,16 (N=27) (N'=22)	17.4	
30		**SW**	SAND, gray, wet, dense; fine to medium grained, trace silt			16,18,15 (N=33) (N'=24)	25.5	
35		**ML**	SILT, gray, moist to wet, stiff			4,6,5 (N=11)	30.8	
40		**ML**	SILT, gray, moist to wet, medium stiff;			2,2,3 (N=5)	26.3	
45		**ML**	SILT, gray, moist to wet, medium stiff; trace fine to medium grained sand			3,3,3 (N=6)	37.9	
50								

LEGEND: 2" O.D. SPT Sampler
3" O.D. California Sampler
Water Level noted during drilling
Water Level measured at later time, as noted

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

BORING LOG

CASCADE MIXED-USE BUILDING
PARCEL #: 31052100307300
ARLINGTON, WASHINGTON

JOB NO. G-5422 **DATE** 6/17/2021 **APPEND** A3

BORING NO. B - 1

Logged By: GD   Date Drilled: 5/24/2021   Surface Elev. Approx. 125' ±
Drilled By: GDP, Inc.

Depth ft.	Elevation	USCS Code	Description	Sample Loc.	Sample No.	SPT Blow Counts + Corrected N	Water Content %	Other Tests/ Comments
		ML	SILT, gray, moist to wet, stiff;			0,4,5 (N=9)	37.7	
55		**ML**	SILT, gray, damp, stiff;			6,7,7 (N=14)	13.3	
			Depth of boring: 56.5 feet. Drilling Method: Hollow-stem auger. Sampling Method: 2"-O.D. standard penetration test sampler driven with 140 lb. hammer and cathead. Groundwater encountered between approximately 7' and 7.5' during drilling.					
60								
65								
70								
75								

LEGEND: 2" O.D. SPT Sampler
3" O.D. California Sampler
Water Level noted during drilling
Water Level measured at later time, as noted

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

BORING LOG

CASCADE MIXED-USE BUILDING
PARCEL #: 31052100307300
ARLINGTON, WASHINGTON

JOB NO. G-5422 **DATE** 6/17/2021 **APPEND** A4

BORING NO. B - 2

Logged By: GD
Drilled By: GDP, Inc.
Date Drilled: 5/24/2021
Surface Elev. Approx. 125' ±

Depth ft.	Elevation	USCS Code	Description	Sample Loc.	Sample No.	SPT Blow Counts + Corrected N	Water Content %	Other Tests/ Comments
		GW	GRAVEL, crushed-rock base coarse on surface, then:					
		SW	SAND, brown, damp, medium dense; fine to medium grained, some oxidation staining	SPT		4,9,8 (N=17) (N'=30)	6.4	
5		SW	SAND, brown, damp to moist, medium dense; fine to coarse grained, some subrounded gravel, some oxidation staining	SPT		5,7,7 (N=14) (N'=22)	9.7	
▽		SW	SAND, gray, wet, medium dense; fine to coarse grained, some subrounded gravel	SPT		6,9,10 (N=19) (N'=28)	12.3	Water in drill hole measured at 7.5' below the ground surface. Interpreted as height of groundwater table.
10		SW	SAND, as above	SPT		4,7,8 (N=15) (N'=19)	18.1	
15		SW	SAND, gray, wet, medium dense; fine to coarse grained, trace subrounded gravel	SPT		2,5,6 (N=11) (N'=12)	20.6	
20		SW	SAND, gray, wet, medium dense; fine to medium grained, trace subrounded gravel	SPT		3,6,9 (N=15) (N'=14)	22.7	
25								

LEGEND:
- 2" O.D. SPT Sampler
- 3" O.D. California Sampler
- ▽ Water Level noted during drilling
- ▼ Water Level measured at later time, as noted

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

BORING LOG

CASCADE MIXED-USE BUILDING
PARCEL #: 31052100307300
ARLINGTON, WASHINGTON

JOB NO. G-5422 **DATE** 6/17/2021 **APPEND** A5

BORING NO. B - 2

Logged By: GD | Date Drilled: 5/24/2021 | Surface Elev. Approx. 125' ±

Drilled By: GDP, Inc.

Depth ft.	Elevation	USCS Code	Description	Sample Loc.	Sample No.	SPT Blow Counts + Corrected N	Water Content %	Other Tests/ Comments
		SW	SAND, gray, wet, medium dense; fine to medium grained			5,5,6 (N=11) (N'=9)	21.0	
30		**SW**	SAND, as above			6,9,13 (N=22) (N'=16)	24.9	
35		**SW**	SAND, as above			4,8,9 (N=17) (N'=11)	27.3	
40		**SW**	SAND, as above			5,11,11 (N=22) (N'=14)	23.5	
45		**SW**	SAND, as above			6,10,16 (N=26) (N'=15)	20.8	
50								

LEGEND: 2" O.D. SPT Sampler; 3" O.D. California Sampler; Water Level noted during drilling; Water Level measured at later time, as noted

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

BORING LOG

CASCADE MIXED-USE BUILDING
PARCEL #: 31052100307300
ARLINGTON, WASHINGTON

JOB NO. G-5422 **DATE** 6/17/2021 **APPEND** A6

BORING NO. B - 2

Logged By: GD
Drilled By: GDP, Inc.
Date Drilled: 5/24/2021
Surface Elev. Approx. 125' ±

Depth ft.	Elevation	USCS Code	Description	Sample Loc.	Sample No.	SPT Blow Counts + Corrected N	Water Content %	Other Tests/ Comments
		SW	SAND, gray, wet, dense; fine to coarse grained			17,18,23 (N=41) (N'=23)	17.3	
55		SW	SAND, as above			5,2,2 (N=4) (N'=2)	19.9	Low blow counts suspected due to sand heave.
			Depth of boring: 56.5 feet. Drilling Method: Hollow-stem auger. Sampling Method: 2"-O.D. standard penetration test sampler driven with 140 lb. hammer and cathead. Groundwater encountered between approximately 7' and 7.5' during drilling.					
60								
65								
70								
75								

LEGEND:
- 2" O.D. SPT Sampler
- 3" O.D. California Sampler
- ▽ Water Level noted during drilling
- ▼ Water Level measured at later time, as noted

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

BORING LOG

CASCADE MIXED-USE BUILDING
PARCEL #: 31052100307300
ARLINGTON, WASHINGTON

JOB NO. G-5422 **DATE** 6/17/2021 **APPEND** A7